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FLOOD INSURANCE STUDY

ALLEN COUNTY, OHIO
UNINCORPORATED AREAS

NOVEMBER 15, 1989

Federal Emergency Management Agency

COMMUNITY NUMBER - 390758

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY

ALLEN COUNTY,
UNINCORPORATED AREAS,
OHIO

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Unincorporated Areas of Allen County, Ohio, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Army Corps of Engineers, Buffalo District, (the Study Contractor) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-86-E-2226, Project Order No. 16. This study was completed in July 1987.

The hydrologic and hydraulic analyses for the Little Ottawa River, Tributaries A, B, and D, and Freed Ditch were obtained from a Flood Hazard Study for the Little Ottawa River (Reference 1).

The hydrologic and hydraulic analyses for Lost Creek Tributary, the Ottawa River, and Pike Run were obtained from a Flood Insurance Study for the City of Lima, Ohio (Reference 2).

The hydrologic and hydraulic analyses for Riley Creek were obtained from a Flood Plain Management Study for the Blanchard River and Riley Creek (Reference 3).

1.3 Coordination

On October 30, 1985, an initial meeting was held between representatives of FEMA, the Ohio Department of Natural Resources (ODNR), Allen County, and the Study Contractor to select the streams to be studied.

A news article announcing the intent to perform a Flood Insurance Study for Allen County was published in the Delphos Herald. The announcement encouraged those with any relevant facts and technical data concerning local flood hazards to provide the information to the Allen County Planning Commission, which in turn forwarded any pertinent information to the Study Contractor.

In addition, the Study Contractor sent letters to the U.S. Soil Conservation Service (SCS); the U.S. Geological Survey (USGS), Water Resources Division; the ODNR; and Allen County requesting technical data applicable to the study.

Officials from Allen County provided information on structures, historical flooding records, and other data for the various streams to be studied. The Ohio Department of Transportation furnished hydraulic data for various bridges throughout Allen County. The draft report was coordinated with community officials.

On November 30, 1988, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, FEMA, and the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated areas of Allen County, Ohio. The area of study is shown on the Vicinity Map (Figure 1). The incorporated areas within the county were excluded from this study.

Flooding caused by overflow of Dug Run, Lost Creek, Lost Creek Tributary, Dug Run Tributary, the Little Ottawa River, Tributary A, Tributary B, Tributary D, Freed Ditch, the Ottawa River, Pike Run, and Riley Creek was studied in detail.

Areas having low development potential or minimal flood hazards were previously studied using approximate analyses. The results were shown on the Flood Hazard Boundary Map for Allen County, Ohio (Reference 4) and are incorporated into this Flood Insurance Study.

The areas studied were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through July 1992. The scope and methods of study were proposed to and agreed upon by FEMA and Allen County.

PUTNAM
HANCOCK
VAN WERT
MERCER
AUGLAIZE
HARDIN
Allen County
Findlay
Van Wert
Delphos
Lima
Wapakoneta
St Marys
Celina
Kenton
Ottawa
Ada
Bluffton
Leipsic
Shawtown
Kalida
Ottoville
Fort Jennings
Rushmore
Vaughnsville
Rimer
Gomer
Middle Point
Landeck
Elida
Southworth
Allentown
Spencerville
Monticello
Mendon
Mercer
Kossuth
Buckland
Glynwood
Neptune
Villa Nova
Moulton
New Knoxville
Botkins
Lock Two
Jackson Center
Kettlersville
Carthagena
Philothea
Macedon
Coldwater
Montezuma
Padua
Erastus
Wabash
Grand Lake St Marys
Celina
Chattanooga
Rockford
Salem
Willshire
Schumm
Glenmore
Wren
Ohio City
Jonestown
Converse
Elgin
Vanadocia
Middlebury
Dixon
Convoy
Scott
Cavett
Wetzel
Tipton
McGill
Haviland
Townley
Payne
Briceton
Broughton
Melrose
Grover Hill
Mandale
Cloverdale
Dupont
Kleferville
Glandorf
Gilboa
Benton Ridge
Pandora
Columbus Grove
Rawson
Mount Cory
Houcktown
Vanlue
Cairo
Rockport
Bluffton
Jenera
Arlington
Mount Blanchard
Williamstown
New Stark
Beaverdam
Dunkirk
Forest
Dola
Patterson
Lafayette
Maysville
Harrod
Westminster
Fort Shawnee
Hume
Orderville
West Newton
Alger
Grant
McGuffey
Foraker
Waynesfield
Holden
Jumbo
Hepburn
Roundhead
New Hampshire
St Johns
Gutman
Island View
Avondale
Mount Victory
Bridgeway
Belle Center
Big Springs
Northwood
Rushsylvania
Byhalia
Orchard Island
Lakeview
Russells Point
Geyer
Santa Fe
Orange
Auglaize
Blanchard
Ottawa
Little
Riley
Hog Creek
Hoaglin
Flatrock
Lost Creek
Hog Creek
Hog Creek
Hog

2.2 Community Description

Allen County encompasses approximately 410 square miles in western Ohio. It is bordered by Van Wert County on the west, Putnam County on the north, Hancock and Hardin Counties on the east, and Auglaize County on the south. Allen County is served by Interstate 75, U.S. Route 30, the CSX railroad, Conrail, the Norfolk Southern Railway, and the Grand Trunk Western Railroad. The 1980 population of Allen County was reported to be 112,241 (Reference 5).

The climate of Allen County is characterized as continental, with warm, humid summers and cold winters. Temperatures range from a mean low of 17.5 degrees Fahrenheit (°F) in January to a mean high of 85.1 °F in July. The mean annual snowfall for the area is approximately 25 inches and the mean annual rainfall is approximately 35 inches (References 6 and 7).

The county is primarily rural and agriculture is an important industry; a little over half the acreage of the county is cropland. The principal crops are corn, soybeans, wheat, oats, and hay.

The relief of the county is nearly level to rolling. Allen County is in the Central Lowlands area, which was completely covered by late Wisconsin glaciers. Glacial drift, overlying limestone bedrock, ranges in thickness from a few feet to several hundred feet throughout the county. Most of the county is till plain, but three end moraines (glacial deposits) lie across the county from east to west. Relief is more pronounced and erosion is a bigger problem in the morainic areas.

All the major streams of Allen County are part of the Maumee River watershed, except for a small section at the eastern edge of the county that is part of the Scioto River watershed (Reference 8).

2.3 Principal Flood Problems

Flooding occurred throughout much of Ohio in March 1913, the result of one the most intense rainstorms ever recorded in northwestern Ohio. However, no specific information is available for that flood relative to Allen County.

Floods of streams in the county are most frequent in the winter and spring, when heavy rains fall on snow-covered or frozen ground. Occasionally, floods occur following intense summer thunderstorms (Reference 9). Because most of Allen County is rural, floods are not well-documented and there is no specific information describing those events.

2.4 Flood Protection Measures

Flood protection measures are not known to exist within the study area.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community.

There were no stream gage stations for Lost Creek, Dug Run, or Dug Run Tributary; therefore, the peak discharges for those streams were calculated using ODNR Bulletin No. 45 (Reference 10). Basin characteristics, such as drainage area and channel slope, were determined using topographic maps (Reference 11). The average annual precipitation values were taken from Bulletin No. 45.

The Ottawa River gage at the City of Allentown, Ohio (no. 04187500), about six miles downstream of the City of Lima, was the principal source of data for defining discharge-frequency relationships for the Ottawa River, Lost Creek Tributary, and Pike Run. The basic procedures for discharge-frequency analyses are outlined in Bulletin No. 17 (Reference 12). A computer program was used for the analysis and the generalized regional skew coefficient at Allentown was applied. The coefficient was calculated using data from stations with at least 25 years of record within a 100-mile radius of the Allentown station.

For the Ottawa River at the Allentown station, peak rates of flow for the 10-, 50-, 100-, and 500-year floods were determined using the above methods of flood frequency analyses. The discharge rates were then factored using a ratio of the drainage area to calculate the Ottawa River peak rates of flow through Lima.

Flow rates for Lost Creek Tributary and Pike Run were first developed using the procedures specified in ODNR Bulletin No. 43 (Reference 13). The method outlined in ODNR Bulletin No. 45 was also applied (Reference 10), using the Burgess and Niple curves for urbanization.

Flood discharges for Riley Creek, the Little Ottawa River, Tributary A, Tributary B, Tributary D, and Freed Ditch were established using TR-20 (Reference 14).

Peak discharge-drainage area relationships for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
LOST CREEK					
just upstream of Reservoir Road	17.11	N/A	N/A	1,625	N/A
just upstream of Unnamed Tributary	10.22	N/A	N/A	1,106	N/A
DUG RUN					
about 1,000 feet downstream of Pioneer Road	11	N/A	N/A	1,102	N/A
just upstream of Unnamed Tributary at Diller Road	7.75	N/A	N/A	877	N/A
just upstream of Dug Run Tributary	3.93	N/A	N/A	466	N/A
DUG RUN TRIBUTARY					
at mouth	2.55	N/A	N/A	405	N/A
LITTLE OTTAWA RIVER					
just upstream of Amanda Road	N/A	2,140	2,940	3,170	4,060
about 500 feet downstream of Bowsher Road	N/A	2,110	2,890	3,110	3,970
TRIBUTARY A					
about 900 feet upstream of mouth	N/A	200	300	330	440

TABLE 1 - SUMMARY OF DISCHARGES (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
TRIBUTARY B					
about 350 feet upstream of Hall Drive	N/A	220	320	340	450
FREED DITCH					
about 400 feet upstream of McClain Road	N/A	950	1,330	1,440	1,850
about 800 feet downstream of Interstate 75	N/A	330	460	500	640
TRIBUTARY D					
about 1,100 feet upstream of Breese Road	N/A	480	690	750	970
PIKE RUN					
at confluence of Pike Run Tributary	2.00	265	360	410	520
at Brower Road	1.25	176	240	270	350
OTTAWA RIVER					
about 1,150 feet downstream of Conrail	133	4,100	5,430	5,990	7,200
RILEY CREEK					
at Putnam Road	N/A	5,400	7,100	8,300	10,500
at Bixel Road	N/A	5,300	6,900	8,000	10,100
about 0.6 mile upstream of Bentley Road	N/A	4,300	5,600	6,500	8,100

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross-section data for the streams studied were obtained by field survey, topographic maps (Reference 11), and aerial photography and photogrammetry (Reference 3). Bridges were surveyed to obtain elevation data and structural geometry. Cross sections between bridges were provided by the Allen County Engineer's Office.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles and on the Flood Insurance Rate Map.

Roughness coefficients (Manning's "n") and contraction and expansion loss coefficients used in the hydraulic computations were chosen by engineering judgment and based on field observations of the streams and floodplain areas. Channel values used for calculating the water-surface profiles average 0.050 for Dug Run, range from 0.04 to 0.05 for Dug Run Tributary, and range from 0.02 to 0.055 for Lost Creek. Overbank values range from 0.05 to 0.10 for Dug Run and Dug Run Tributary, and from 0.045 to 0.07 for Lost Creek. Contraction coefficients range from 0.20 to 0.30 for Dug Run, Dug Run Tributary, and Lost Creek. Expansion coefficients range from 0.40 to 0.60 for Dug Run and Dug Run Tributary, and from 0.40 to 0.80 for Lost Creek. For Lost Creek Tributary, the Ottawa River, and Pike Run, roughness values average 0.03 for the main channel and 0.10 for the overbanks. For Riley Creek, values range from 0.04 to 0.06 for the channel and from 0.07 to 0.17 for the overbanks.

For Dug Run, Dug Run Tributary, Lost Creek, Lost Creek Tributary, the Ottawa River, and Pike Run, water-surface profiles were developed using the HEC-2 step-backwater computer program (Reference 15). For Dug Run, Dug Run Tributary, and Lost Creek, main stream computations were started at normal depth. Water-surface elevations at the confluence of the main stream were used as starting elevations for the tributaries. Starting water-surface elevations for Lost Creek Tributary, the Ottawa River, and Pike Run were determined using the slope-area method.

For the Little Ottawa River, Tributaries A, B, and D, Freed Ditch, and Riley Creek, water-surface elevations were developed using the WSP-2 step-backwater computer program (Reference 16).

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the map and described in the exhibit labeled Elevation Reference Marks.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24000 with a contour interval of 5 feet (Reference 11) and orthophoto maps at a scale of 1:4800 (Reference 17).

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE) and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary was delineated using the Flood Hazard Boundary Map for Allen County (Reference 4).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be

adopted directly or that can be used as a basis for additional floodway studies.

The floodways for this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections and are shown in Table 2, Floodway Data. The computed floodways are shown on the Flood Insurance Rate Map. In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown. Portions of the floodway for Tributary A lie within an area not included in this study.

Along streams where floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplain will not cause more than a 1.0-foot increase in the base flood elevations at any point within the community.

The area between the floodway and the 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0-foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

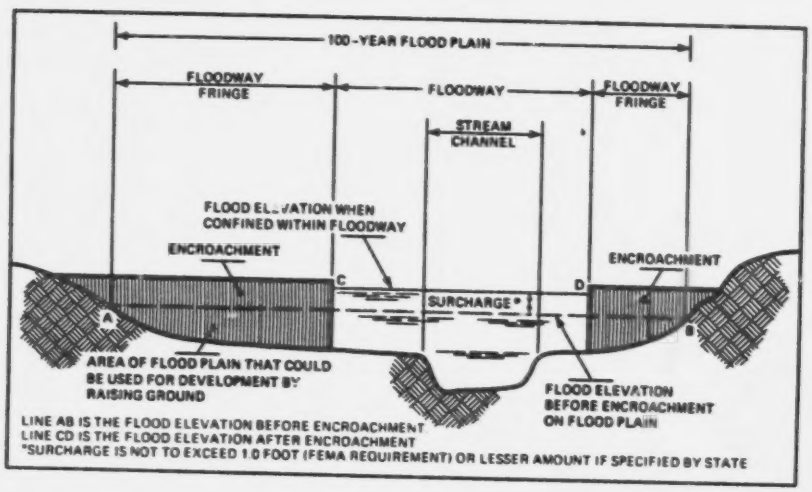

100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FIGURE 2 - Floodway Schematic

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
OTTAWA RIVER								
A	5825[2]	179[3]	1622	3.69	838.9	838.9	839.4	0.5
B	7000[2]	144[3]	1615	3.71	839.6	839.6	840.1	0.5
LITTLE OTTAWA RIVER								
A	175	292	2014	1.6	827.3	827.3	827.8	0.5
B	870	231	1399	2.3	827.5	827.5	828.0	0.5
C	2900	231	1392	2.3	830.7	830.7	831.2	0.5
D	8680	376	1988	1.6	839.6	839.6	840.1	0.5
E	10,020	409	2020	1.5	841.3	841.3	841.8	0.5
F	11,820	341	1749	1.8	843.6	843.6	844.1	0.5
G	13,260	301	1575	2.0	845.4	845.4	845.9	0.5
H	16,480	202	1072	2.9	850.5	850.5	851.0	0.5
I	17,210	261	1582	2.0	851.8	851.8	852.3	0.5
J	18,140	374	2534	1.2	853.2	853.2	853.7	0.5
K	21,040	215	1214	2.6	856.9	856.9	857.4	0.5
L	22,120	330	1673	1.9	857.9	857.9	858.4	0.5
TRIBUTARY A								
A	890	87	227	1.5	833.0	833.0	833.5	0.5

[1]FEET ABOVE MOUTH
[2]FEET ABOVE ADGATE ROAD
[3]THIS WIDTH EXTENDS WITHIN AREA NOT INCLUDED

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

ALLEN COUNTY, OH
(UNINCORPORATED AREAS)

FLOODWAY DATA

OTTAWA RIVER—LITTLE OTTAWA RIVER—TRIBUTARY A

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
TRIBUTARY B								
A	810	228	1187	0.3	843.9	843.9	844.4	0.5
B	1890	95	255	1.4	846.0	846.0	846.5	0.5
TRIBUTARY D								
A	2430	48	236	3.2	885.8	885.8	886.3	0.5
LOST CREEK								
A	1970	39	276	5.9	868.9	868.9	868.9	0.0
B	3050	68	336	4.8	871.7	871.7	871.7	0.0
C	4550	55	438	3.7	874.5	874.5	874.5	0.0
D	5800	145	860	1.3	876.0	876.0	876.1	0.1
E	6600	124	408	2.7	876.2	876.2	876.5	0.3
F	8710	51	338	3.3	878.4	878.4	878.8	0.4
G	9400	213	896	1.2	878.9	878.9	879.5	0.6
H	10,280	106	699	1.6	879.5	879.5	880.1	0.6
I	11,400	40	247	4.5	880.1	880.1	880.9	0.8
J	11,900	55	307	3.6	890.8	890.8	890.8	0.0
K	13,800	89	493	2.3	893.9	893.9	894.6	0.7
LOST CREEK TRIBUTARY								
A	0.89[2]	61[3]	223	3.24	882.3	882.3	882.7	0.4

[1]FEET ABOVE MOUTH
[2]MILES ABOVE INTERSTATE 75
[3]THIS WIDTH IS WITHIN AREA NOT INCLUDED

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

ALLEN COUNTY, OH
(UNINCORPORATED AREAS)

FLOODWAY DATA

TRIBUTARY B—TRIBUTARY D—LOST CREEK—LOST CREEK TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
RILEY CREEK								
A	0.02	684	3496	2.4	783.6	783.6	784.6	1.0
B	0.36	345	2043	4.0	786.0	786.0	787.0	1.0
C	0.78	560	3991	2.1	788.1	788.1	789.1	1.0
D	1.43	989	4425	1.8	789.3	789.3	790.3	1.0
E	1.59	312	2366	3.4	791.1	791.1	792.1	1.0
F	2.02	491	2613	3.1	792.8	792.8	793.8	1.0
G	2.30	204	2158	3.7	799.0	799.0	800.0	1.0
H	2.95	431	2434	3.8	802.0	802.0	803.0	1.0
I	3.73	508	2885	2.8	805.2	805.2	806.2	1.0
J	4.52	613	3414	2.3	807.0	807.0	808.0	1.0
K	5.04	475	2776	2.9	809.3	809.3	810.3	1.0
L	5.74	543	2662	3.0	812.4	812.4	813.4	1.0
FREED DITCH								
A	12,010[2]	291	895	1.61	881.7	881.7	882.2	0.5
B	13,780[2]	98	244	2.03	882.9	882.9	883.4	0.5

[1]MILES ABOVE PUTNAM ROAD
[2]FEET ABOVE MOUTH

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

ALLEN COUNTY, OH
(UNINCORPORATED AREAS)

FLOODWAY DATA

RILEY CREEK—FREED DITCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
DUG RUN								
A	10,080	87	473	2.3	790.3	790.3	791.0	0.7
B	12,470	69	440	2.5	793.2	793.2	794.2	1.0
C	16,205	73	420	2.6	797.8	797.8	798.7	0.9
D	19,390	44	308	2.8	801.6	801.6	802.5	0.9
E	23,200	35	239	3.7	805.9	805.9	806.8	0.9
F	27,131	40	222	4.0	812.9	812.9	813.3	0.4
G	29,151	65	284	3.1	816.2	816.2	816.9	0.7
H	30,975	29	157	3.0	818.6	818.6	819.5	0.9
I	33,360	37	184	2.5	823.4	823.4	823.8	0.4
DUG RUN TRIBUTARY								
A	1130	30	147	2.8	816.6	816.6	817.4	0.8
B	3030	30	168	2.4	818.8	818.8	819.8	1.0
C	5045	32	166	2.4	822.0	822.0	822.5	0.5
D	5895	49	168	2.4	823.4	823.4	824.1	0.7

[1]FEET ABOVE MOUTH

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

ALLEN CO, OH

(UNINCORPORATED AREAS)

FLOODWAY DATA

DUG RUN—DUG RUN TRIBUTARY

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

Flood Insurance Studies have been published for the City of Lima (Reference 2) and the Village of Fort Shawnee, Ohio (Reference 18). The delineation of the Ottawa River and Lost Creek Tributary in the City of Lima study differs from that in this study due to better use of topographic information for this study. Detailed information for Tributary A was not available at the time the Fort Shawnee study was prepared and is therefore not shown therein. In addition, the

floodway delineation for Freed Ditch is more accurate in this study than in the Fort Shawnee study. The Fort Shawnee and Lima studies will be revised in the future to reflect the new information.

A Flood Insurance Study published for Van Wert County, Ohio (Reference 19) is in agreement with this study.

Flood Insurance Studies in progress for Hancock, Auglaize, and Putnam Counties, Ohio (References 20-22) are in agreement with this study.

This Flood Insurance Study supersedes the previously printed Flood Hazard Boundary Map for Allen County (Reference 4).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 175 West Jackson Boulevard, 4th Floor, Chicago, Illinois 60604-2698.

9.0 REFERENCES AND BIBLIOGRAPHY

1. U.S. Department of Agriculture, Soil Conservation Service, Flood Hazard Study, Little Ottawa River, Allen County, Ohio, April 1979.

2. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, City of Lima, Allen County, Ohio, February 1979.

3. U.S. Department of Agriculture, Soil Conservation Service, Flood Plain Management Study: The Blanchard River and Riley Creek, Allen, Putnam, Hancock and Hardin Counties, Ohio, December 1987.

4. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Allen County, Unincorporated Areas, Ohio, February 1978.

5. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Ohio, Washington, D.C., February 1982.

6. ————, National Oceanic and Atmospheric Administration, Climate of the States, 1974.

7. Allen County Planning Commission, Community Profile, 1985.

8. Ohio Department of Natural Resources, Land Capability Analysis in Allen County, April 1983.

9. U.S. Army Corps of Engineers, Detroit District, Flood Plain Information, Ottawa River in Allen County, Ohio, June 1967.

10. Ohio Department of Natural Resources, Division of Water, Bulletin No. 45, Floods in Ohio, Magnitude and Frequency, E.E. Webber and W.P. Bartlett, Jr., May 1977.

11. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 5 Feet: Harrod, Ohio 1961; Cridersville, Ohio, 1961, photorevised 1971; Elida, Ohio, 1962, photorevised 1982; Cairo, Ohio, 1960, photorevised 1971; Lima, Ohio, 1961, photorevised 1971.

12. U.S. Water Resources Council, Bulletin No. 17, Guidelines for Determining Flood Flow Frequency, March 1976.

13. Ohio Department of Natural Resources, Division of Water, Bulletin No. 43, Floods in Ohio, Magnitude and Frequency, Columbus, Ohio, 1969.

14. U.S. Department of Agriculture, Soil Conservation Service, Engineering Division, Technical Release No. 20, Computer Program for Project Formulation, Hydrology, May 1982.

15. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Computer Program 723-X6-L202A, Davis, California, April 1984.

16. U.S. Department of Agriculture, Soil Conservation Service, Technical Release No. 61, WSP-2 Computer Program, May 1976.

17. Woolpert Consultants, Orthophoto Base Map, Scale 1:4800, Dayton, Ohio, April 1984.

18. Federal Emergency Management Agency, Flood Insurance Study, Village of Fort Shawnee, Allen County, Ohio, August 1984.

19. ————, Flood Insurance Study, Van Wert County, Unincorporated Areas, Ohio, September 1987.

20. ————, Flood Insurance Study, Hancock County, Unincorporated Areas, Ohio, in progress.

21. ————, Flood Insurance Study, Auglaize County and Incorporated Areas, Ohio, in progress.

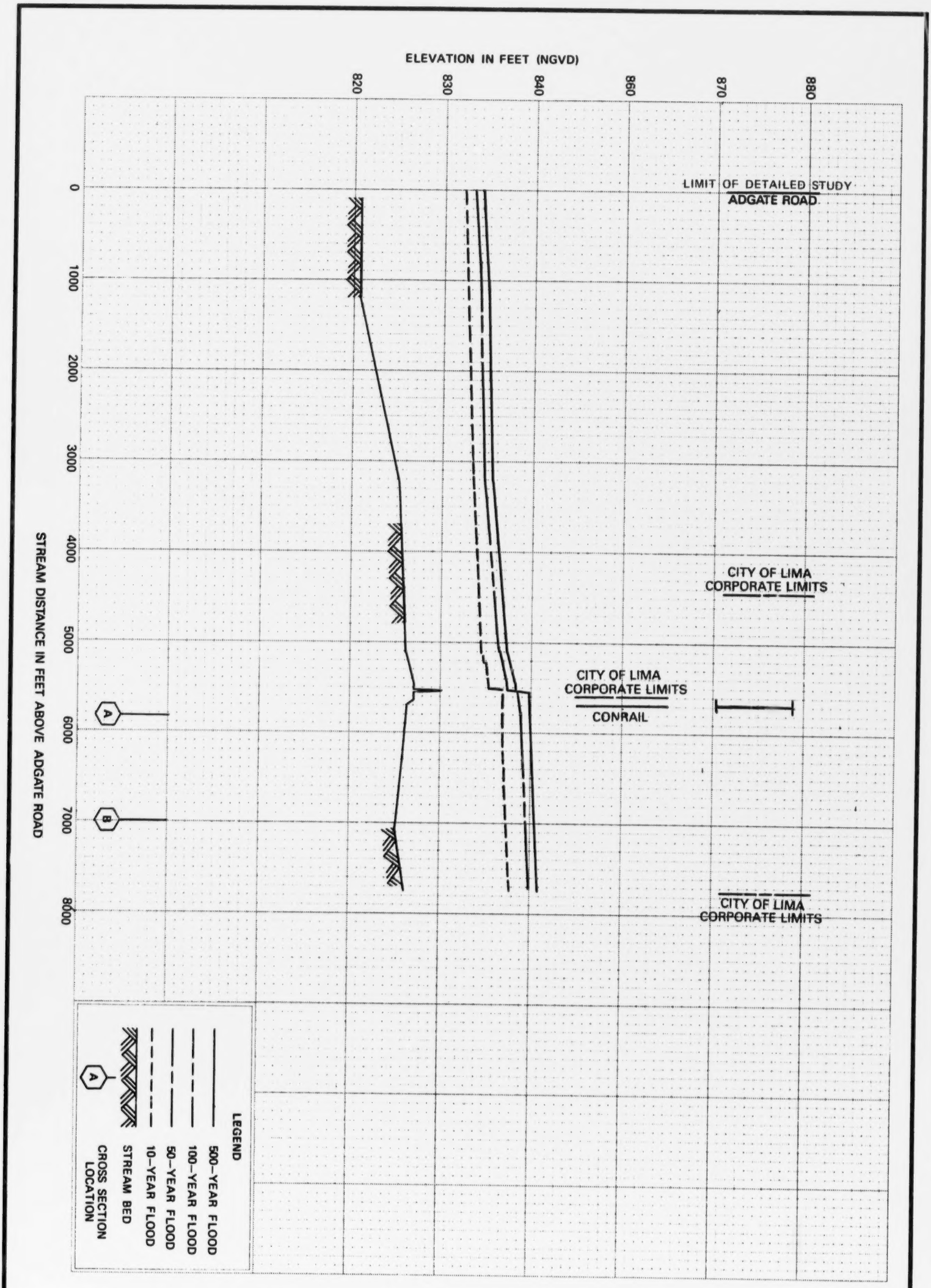
22. ————, Flood Insurance Study, Putnam County, Unincorporated Areas, Ohio, in progress.

ELEVATION REFERENCE MARKS

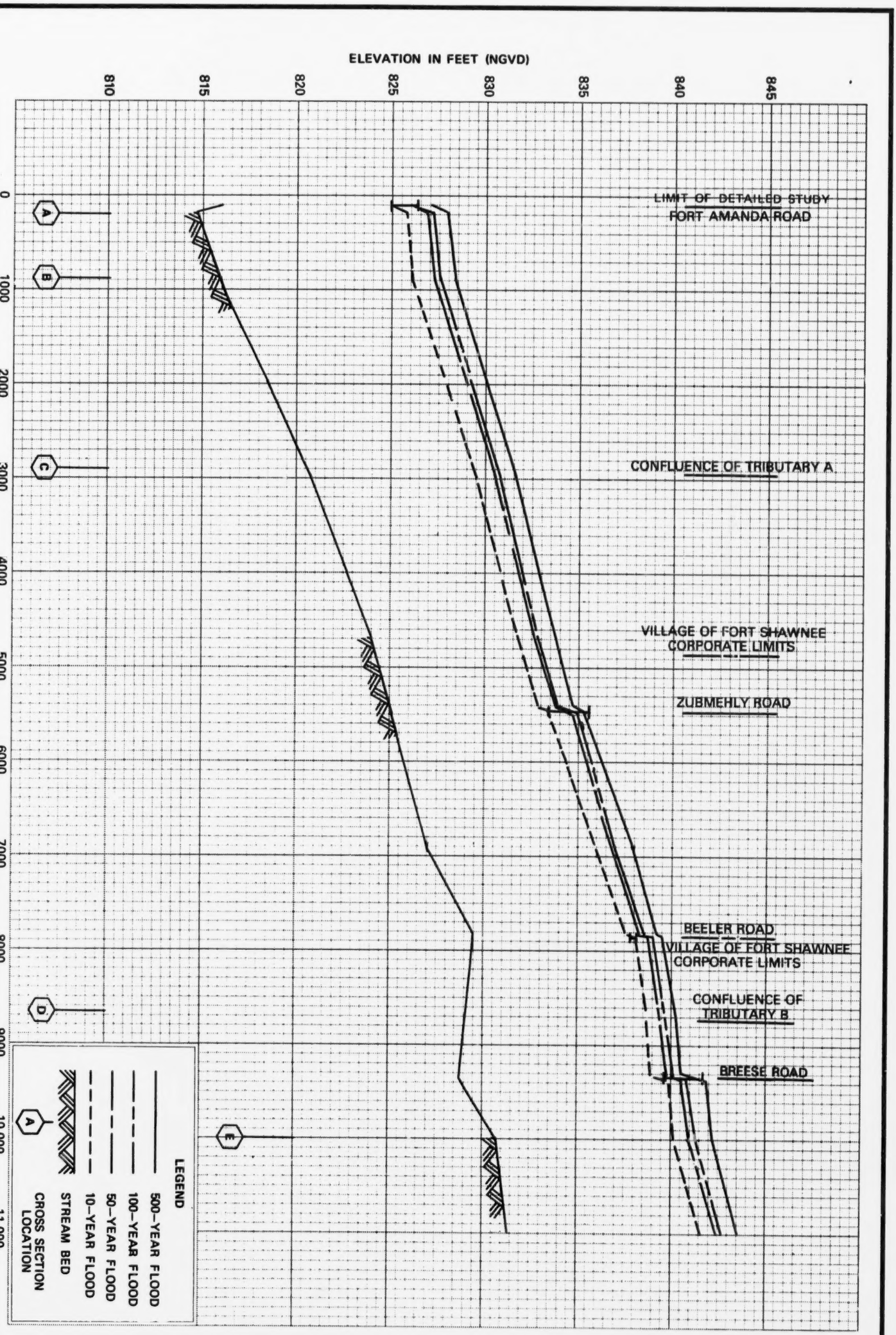
REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
1	0038	791.54	U.S. Geological Survey disk stamped "17 ADP 1959 reset 1973" set on top of southwest wingwall of Pioneer Road bridge over Dug Run
2	0038	796.76	chiseled cross on southeast wingwall of Sunnydale Street bridge over Dug Run
3	0039	800.80	chiseled cross on top of west abutment on upstream side of Diller Road bridge over Dug Run
4	0102	812.13	chiseled cross on northwest abutment of Elida Road bridge over Dug Run
5	0102	815.87	chiseled cross on southeast wingwall of Conrail bridge over Dug Run
6	0102	813.78	chiseled cross on northwest wingwall of Neely Road bridge over Dug Run
7	0102	818.32	chiseled cross on northeast wingwall of Eastown Road bridge over Dug Run
8	0102	821.93	railroad spike in power pole southwest of intersection of Allentown and Eastown roads
9	0102	827.23	railroad spike in power pole just southeast of Eastown Road bridge over Dug Run Tributary
10	0107	878.33	chiseled cross on top of southwest corner of headwall of culvert for Lost Creek under Reservoir Road
11	0115	825.95	chiseled cross on top of northeast corner of concrete siphon box located south of Amanda Road on east bank of the Little Ottawa River
12	0115	841.49	chiseled cross on top of northwest concrete abutment of Breese Road bridge over the Little Ottawa River

ELEVATION REFERENCE MARKS

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
13	0115	853.65	chiseled cross on top of northwest abutment of Beeler Road Bridge over the Little Ottawa River
14	0120	882.10	chiseled cross on northeast wingwall of McClain Road bridge over Freed Ditch
15	0065	785.67	chiseled cross in southwest wingwall of Putnam Road bridge over Riley Creek
16	0065	794.87	chiseled cross in southwest wingwall of Pandora Road bridge over Riley Creek
17	0070	797.76	chiseled cross in southwest wingwall of Phillips Road bridge over Riley Creek
18	0070	810.27	chiseled cross in southwest wingwall of Tom Fett Road bridge over Riley Creek
19	0070	810.46	chiseled cross in southwest wingwall of Bentley Road bridge over Riley Creek
20	0108	844.24	nail in power pole located on north side of Amanda Road about 7,000 feet south of Conrail underpass
21	0109	880.33	chiseled square on top of southwest abutment of Fenway Drive bridge over Lost Creek
22	0109	883.34	filed cross on bolt at base of hydrant located at south end of Sunnymeade Lane, north of Lost Creek



01P	FEDERAL EMERGENCY MANAGEMENT AGENCY **ALLEN COUNTY, OH** (UNINCORPORATED AREAS)	**FLOOD PROFILES** **OTTAWA RIVER**



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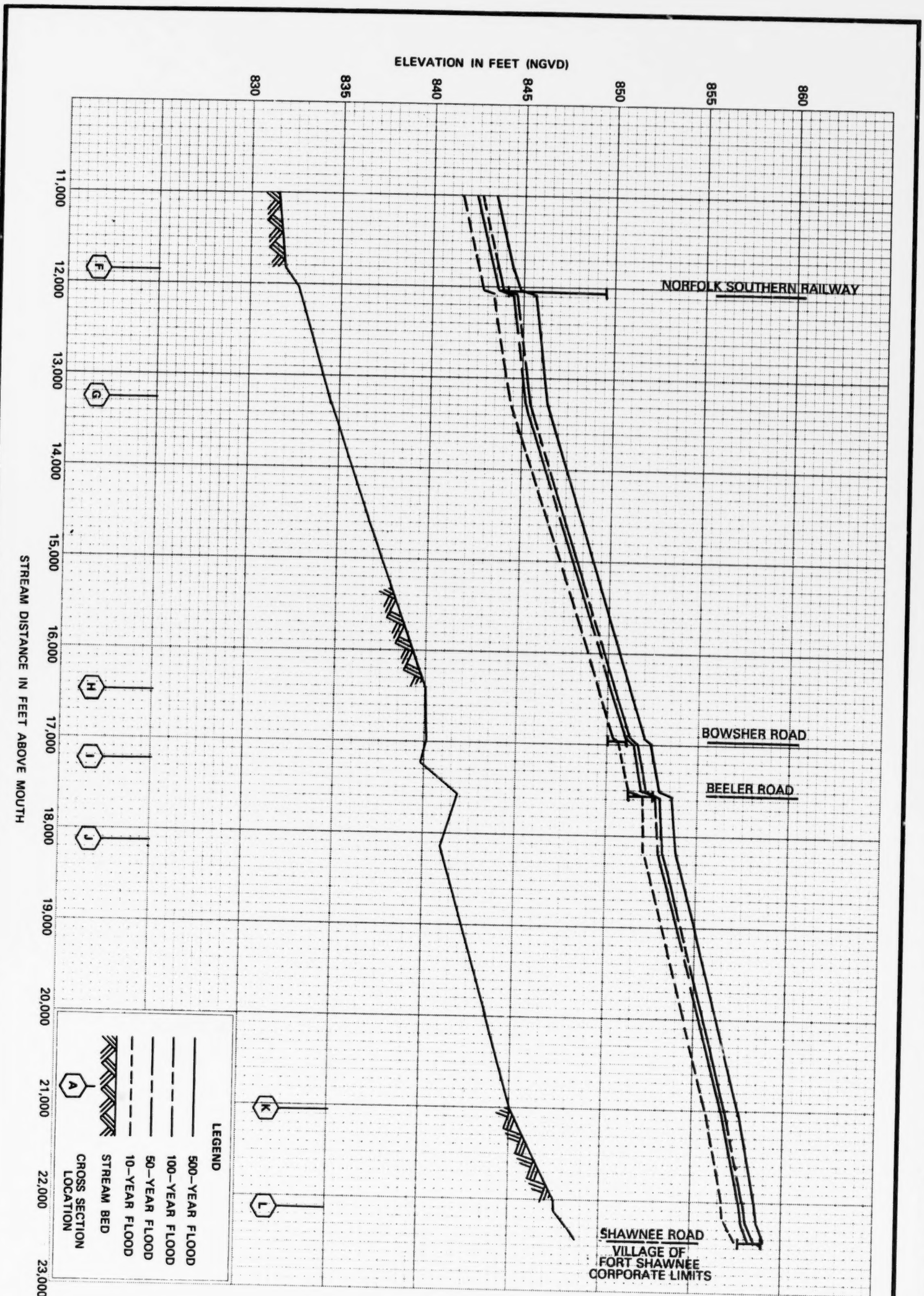


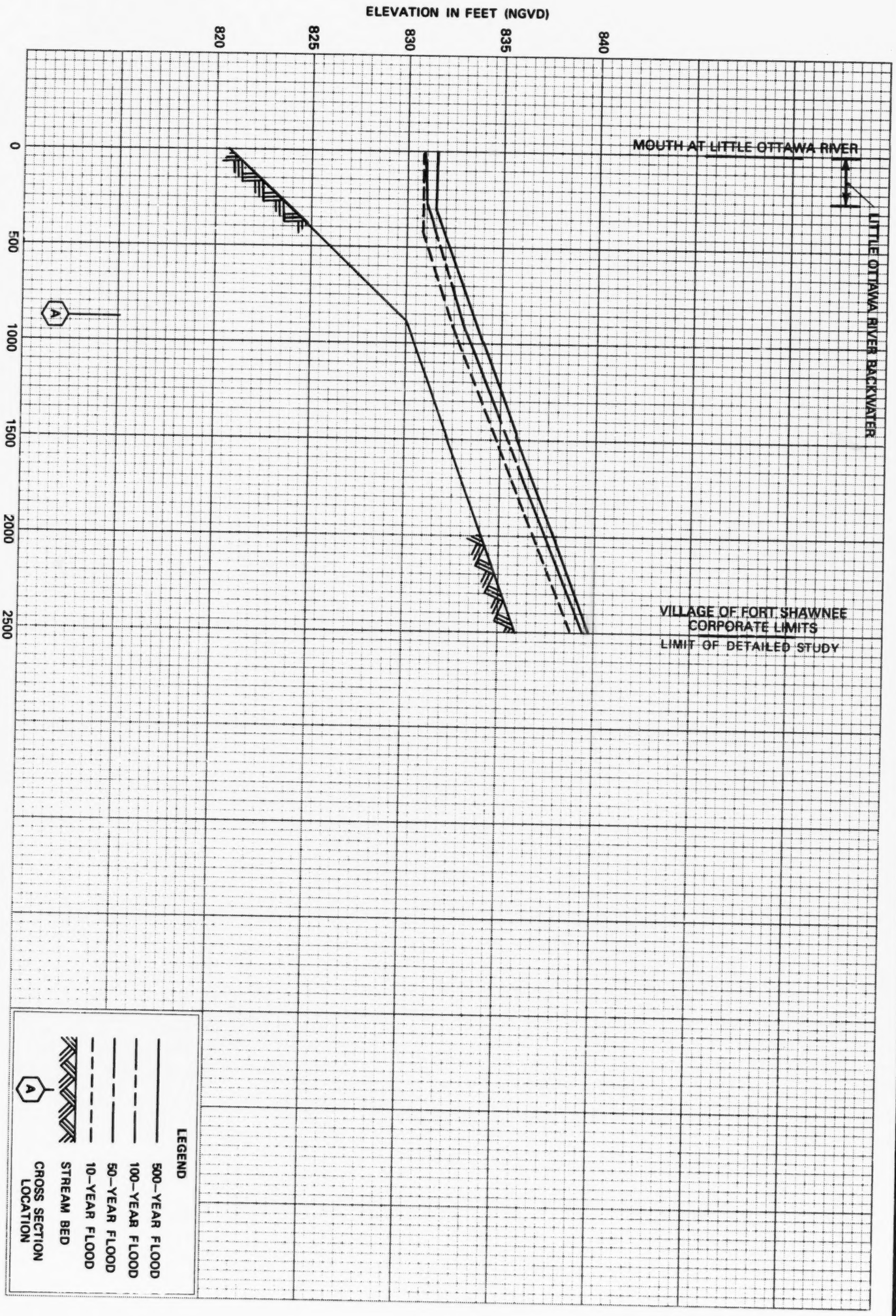
03P

FEDERAL EMERGENCY MANAGEMENT AGENCY

ALLEN COUNTY, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

LITTLE OTTAWA RIVER



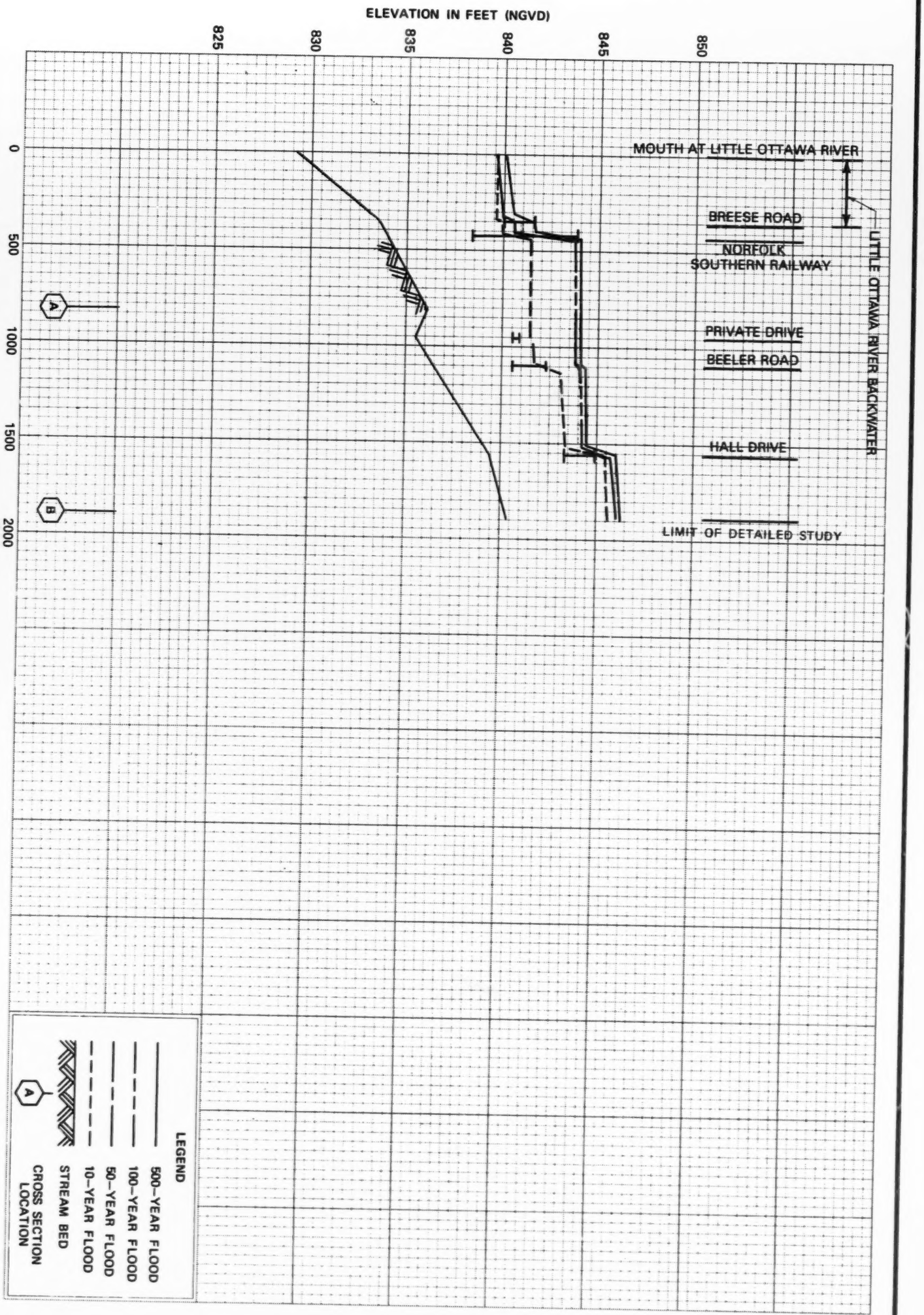
FEDERAL EMERGENCY MANAGEMENT AGENCY

ALLEN COUNTY, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

TRIBUTARY A

04P



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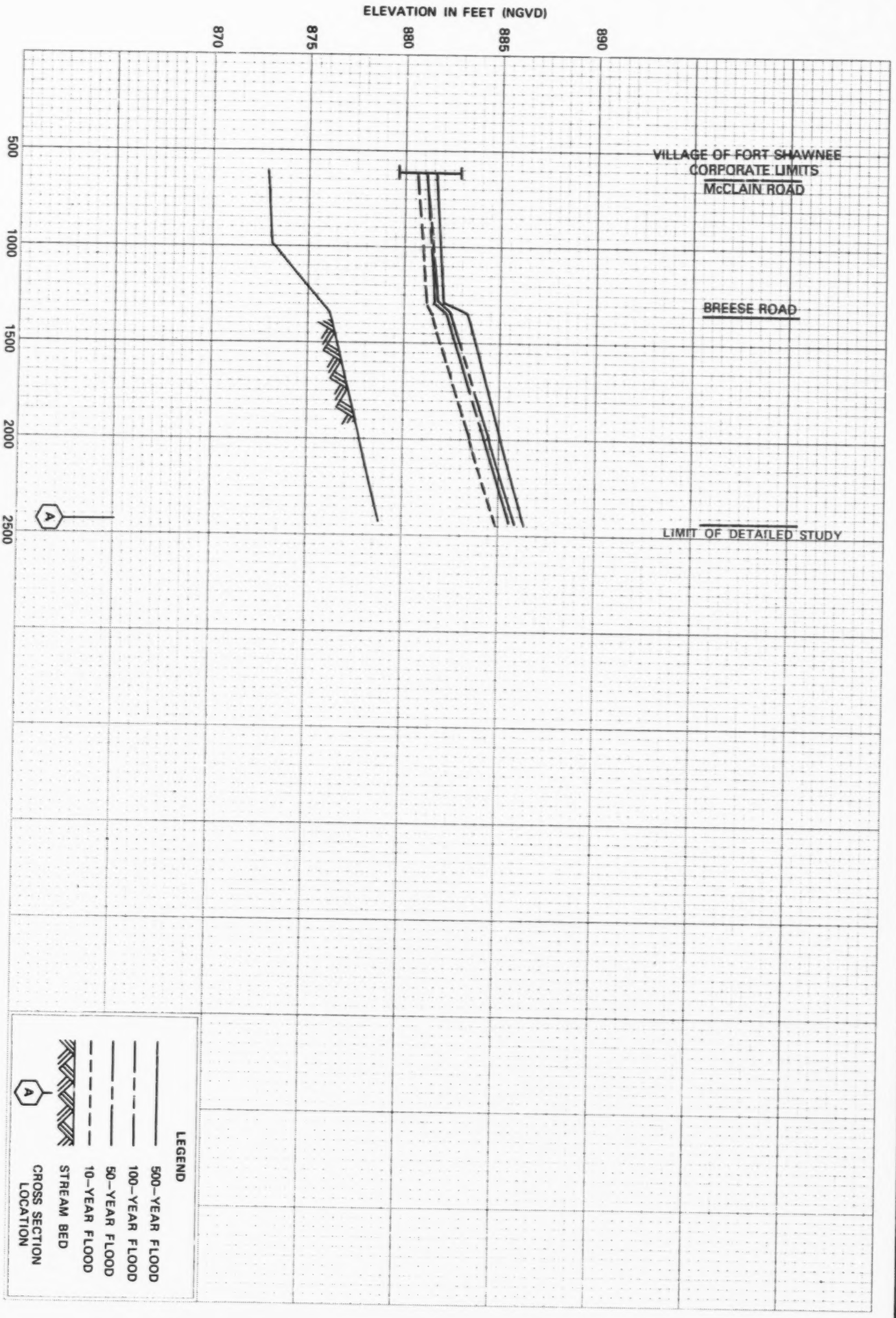


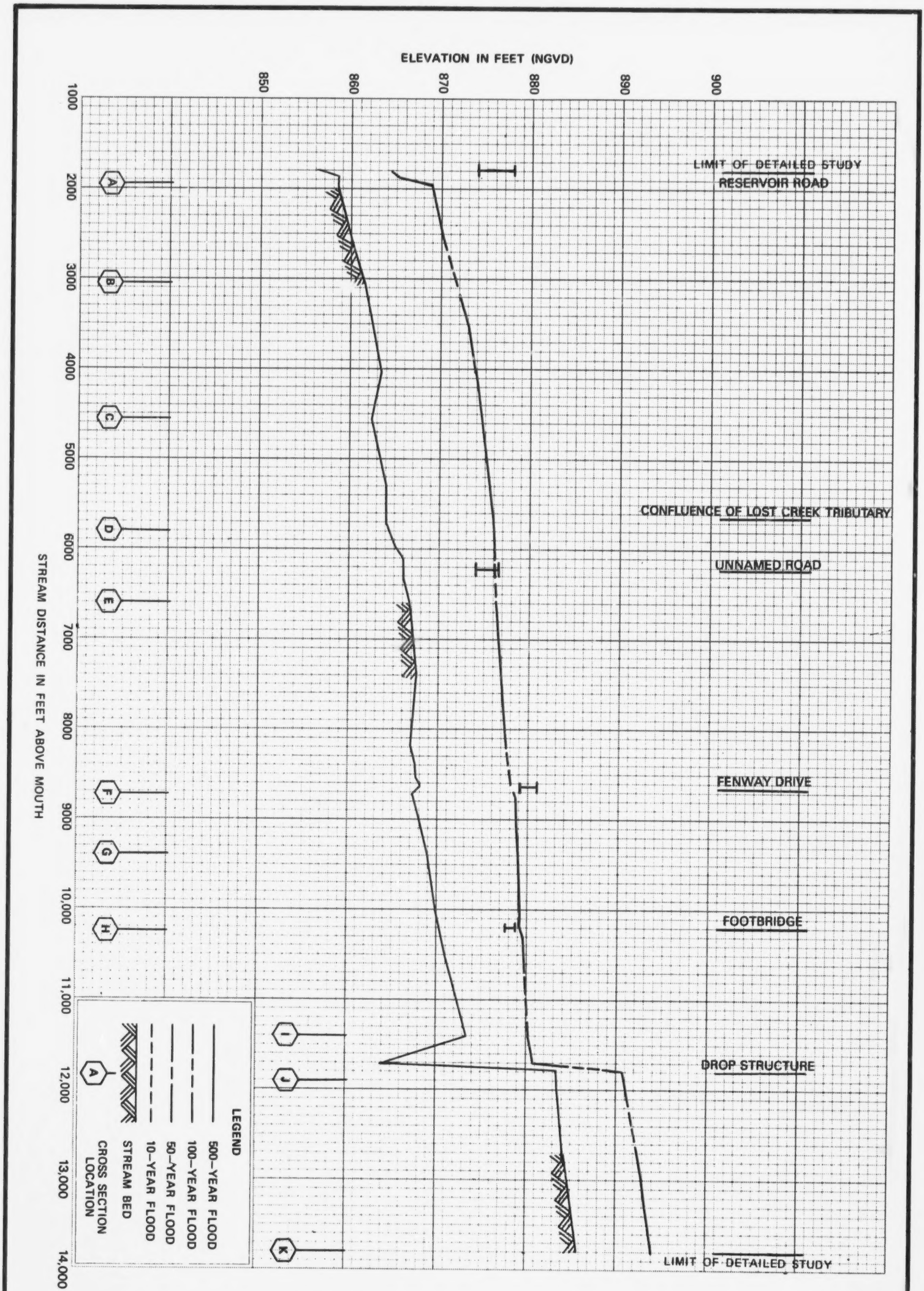
06P

FEDERAL EMERGENCY MANAGEMENT AGENCY

ALLEN COUNTY, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

TRIBUTARY D



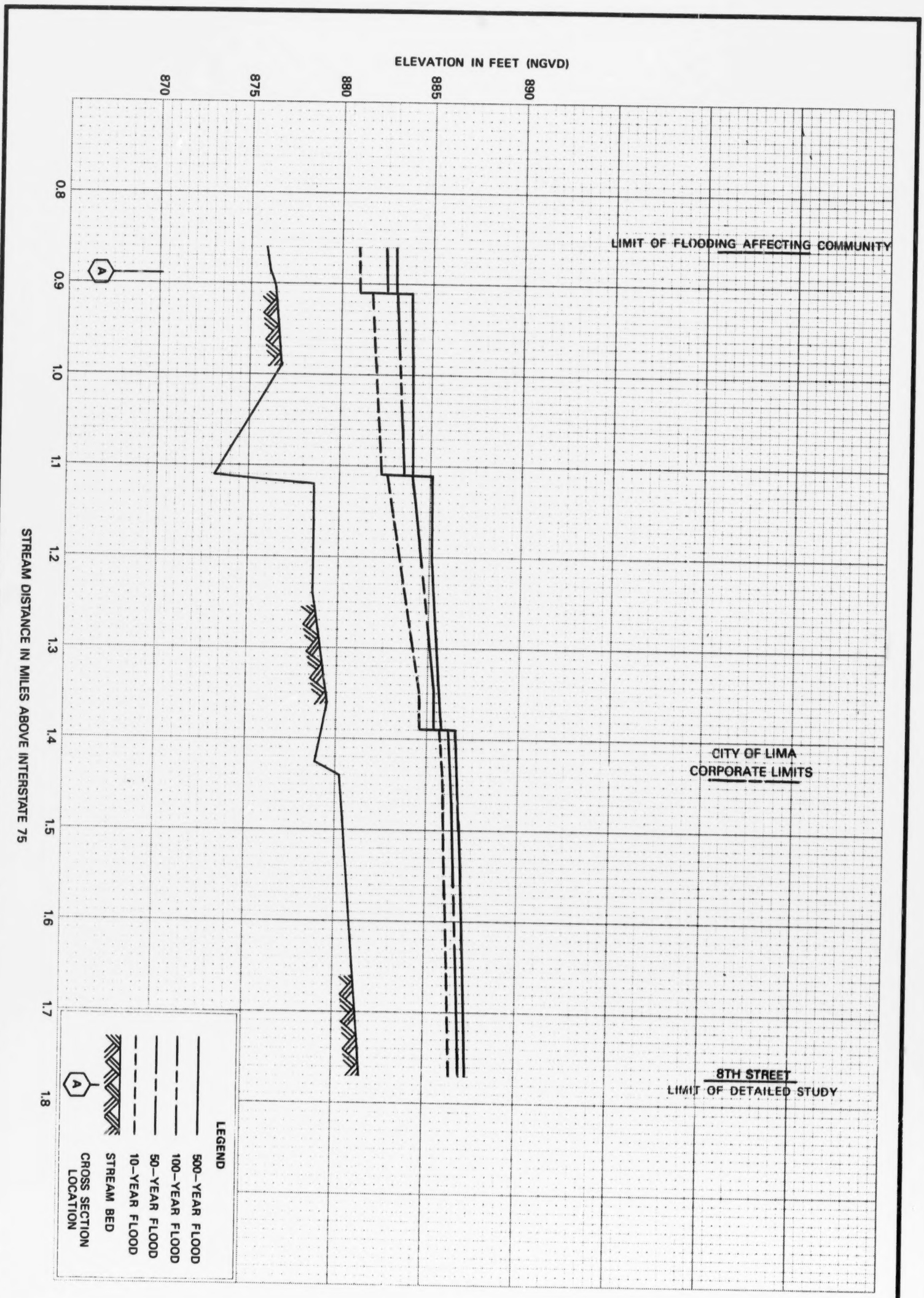
07P

FEDERAL EMERGENCY MANAGEMENT AGENCY

ALLEN COUNTY, OH
(UNINCORPORATED AREAS)

FLOOD PROFILES

LOST CREEK



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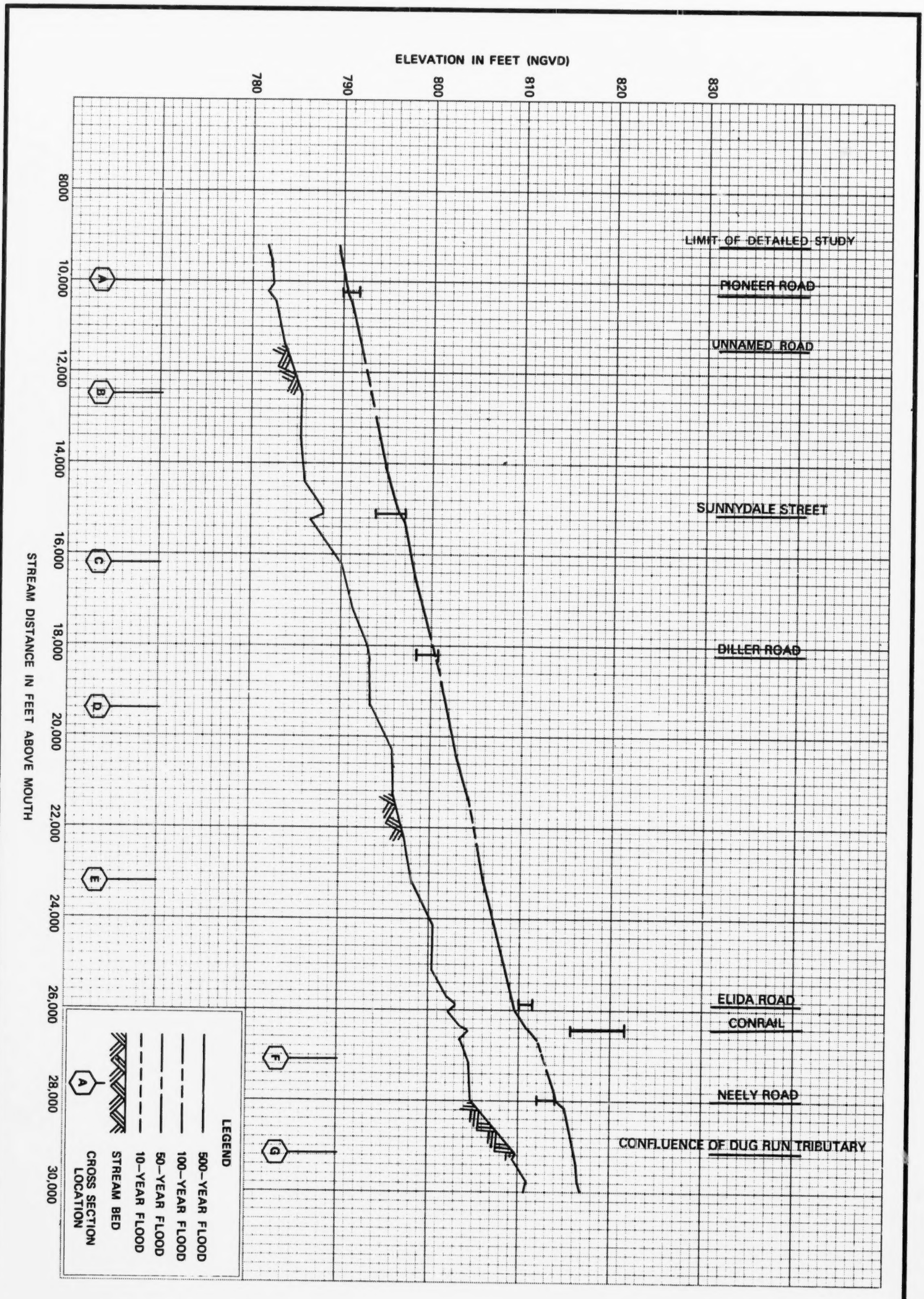

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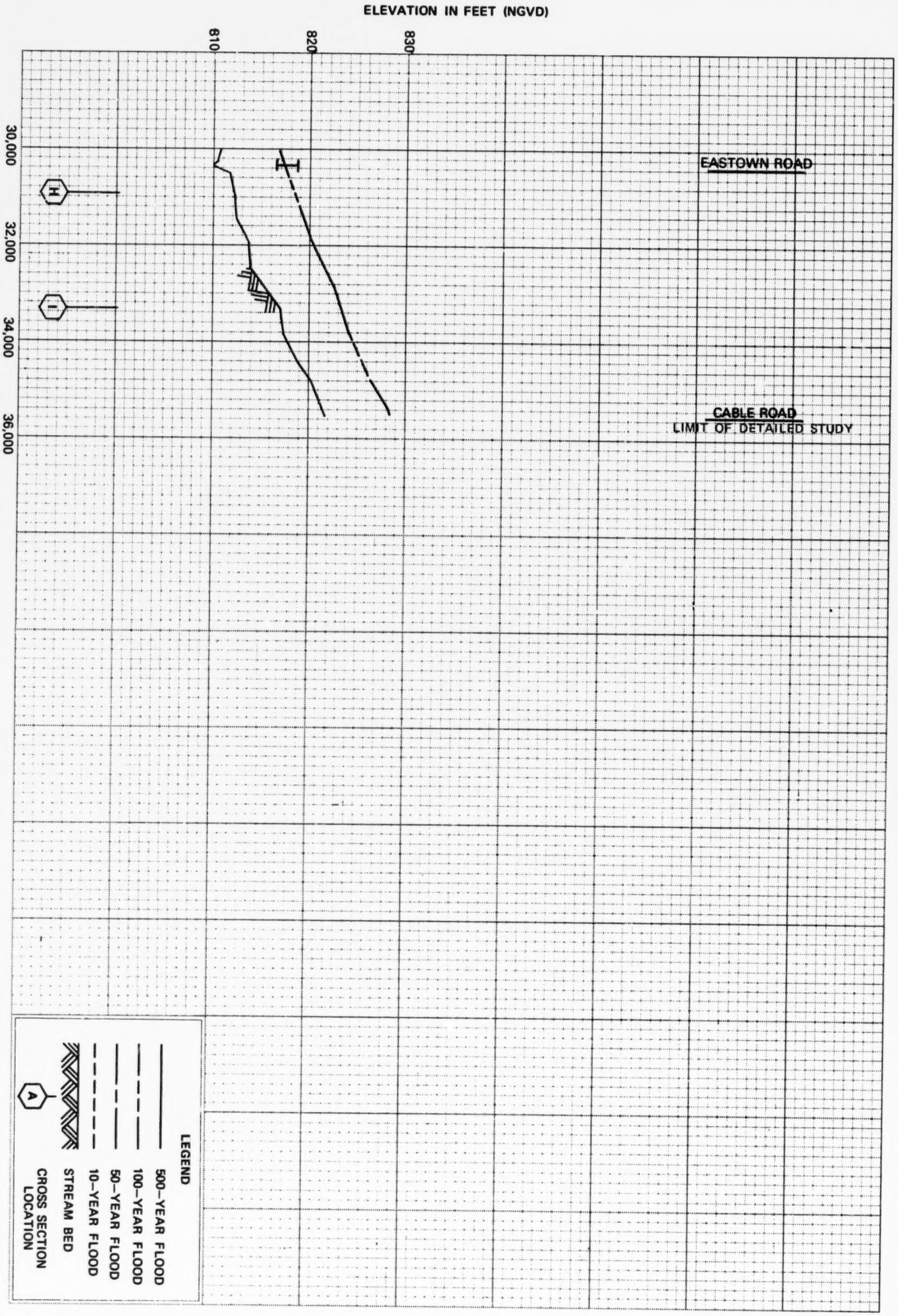

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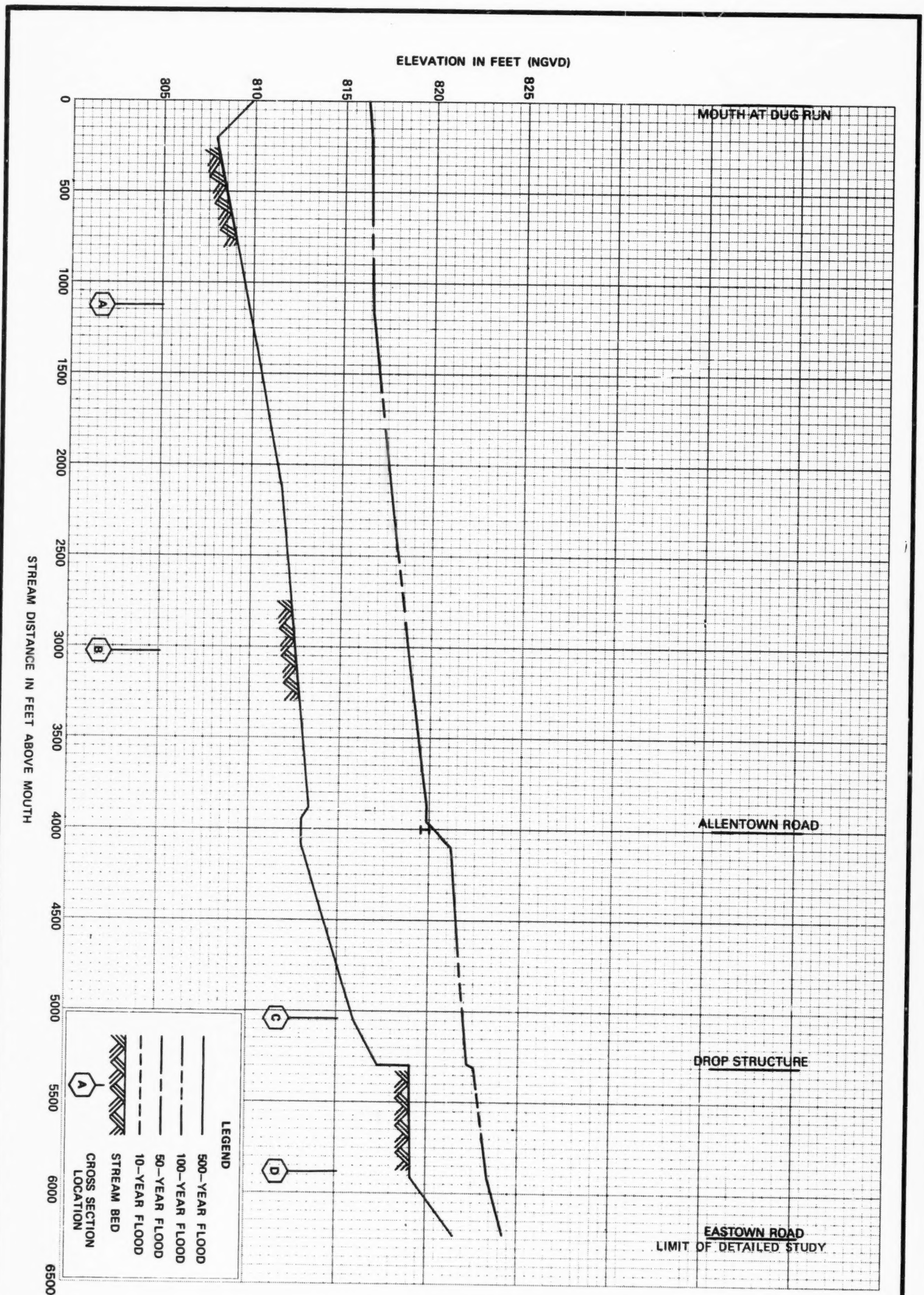

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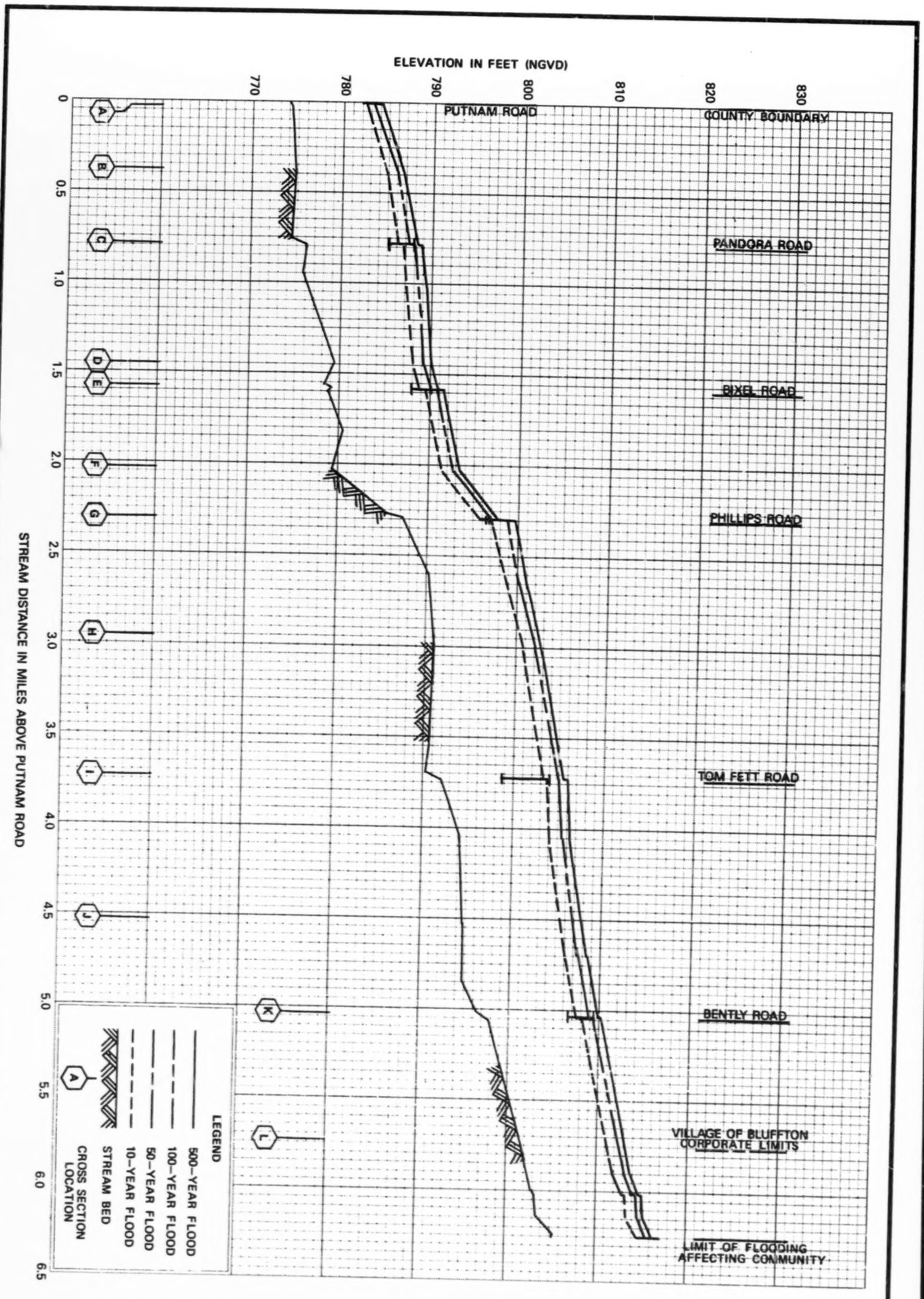

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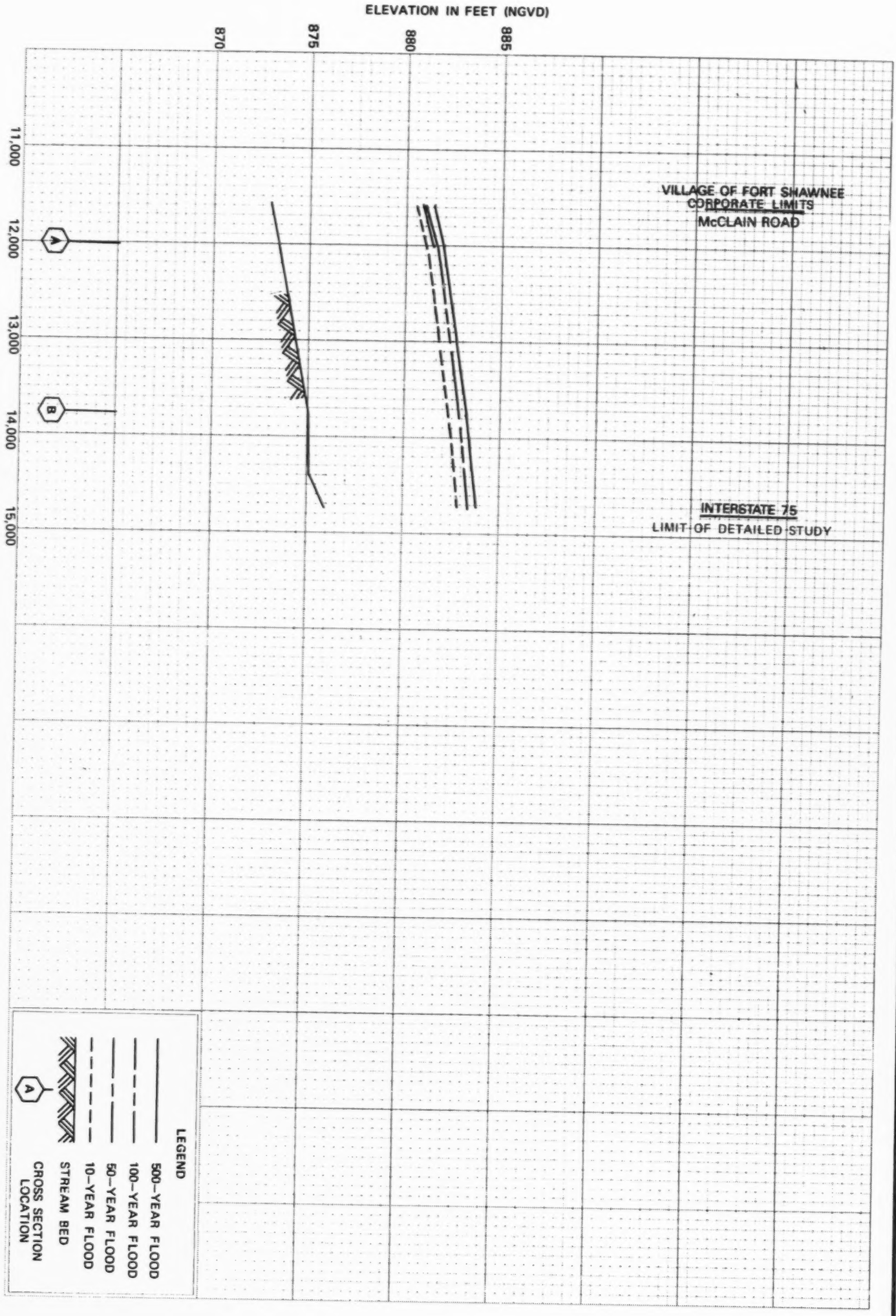

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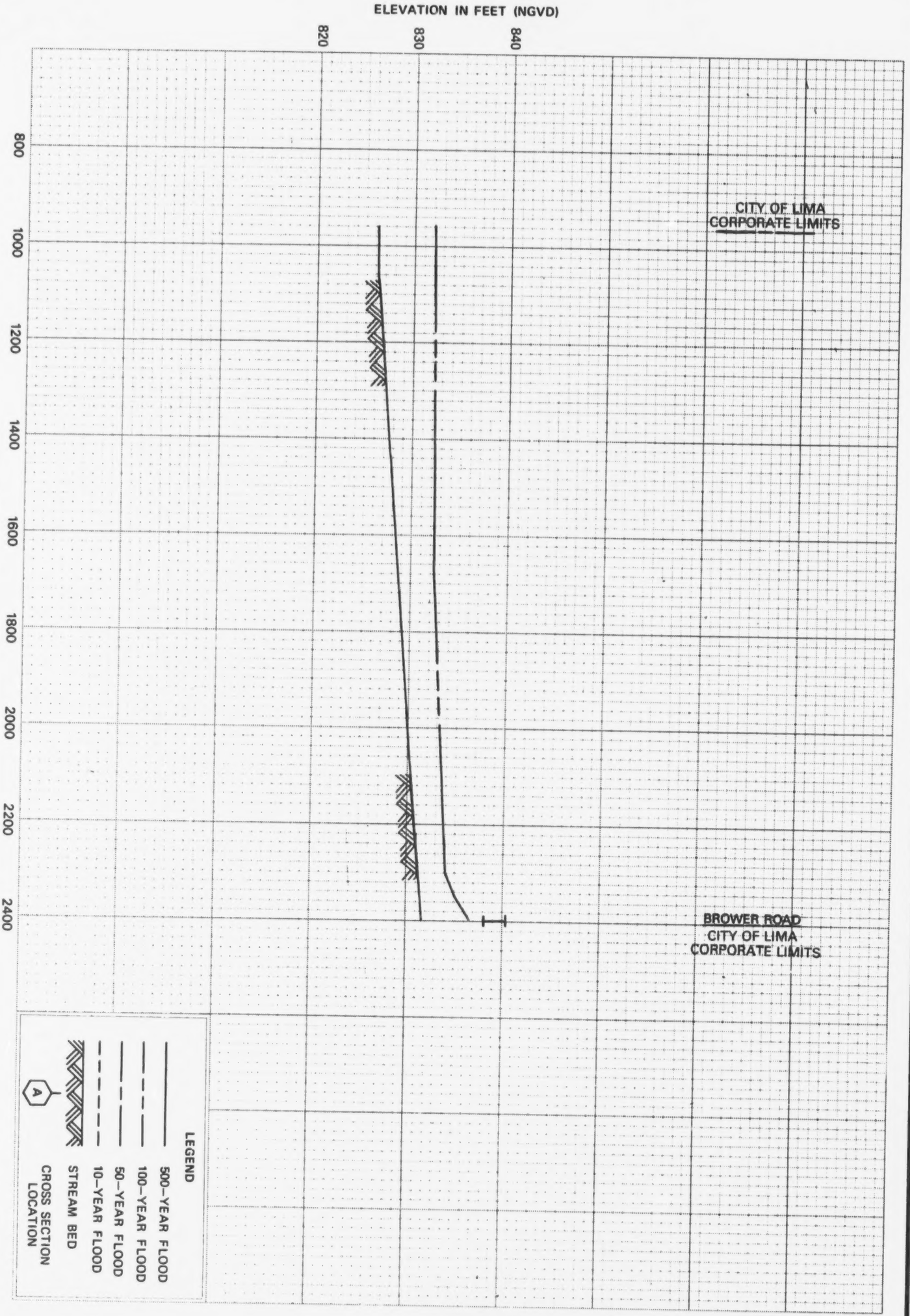

14P	FEDERAL EMERGENCY MANAGEMENT AGENCY **ALLEN COUNTY, OH** (UNINCORPORATED AREAS)	**FLOOD PROFILES** **PIKE RUN**